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2

SECTION

Executive Summary

UTAH STATE WATER PLAN - WEBER RIVER BASIN PLAN

Sections A and B, not summarized, are appendages to this river basin plan. Section A provides explanations of acronyms and abbreviations used throughout the document and definitions of commonly used words or terms associated with the use and development of water resources. Section B lists references used to prepare the document. In addition to this document's 19 sections, the *State Water Plan* contains Section 20, *River Basin Summaries*, and Section 21, *Status Reports*. Although the following discussions present the basic information contained in the document, the reader is urged to refer to individual sections for detailed information and data on specific water-related topics.

2.1 Foreword

State water planning is a two-phased process. The first phase included the distribution of the *State Water Plan* in 1990 that addresses water resources issues on a statewide basis. Individual *River Basin Plans* are prepared to provide a detailed analysis and report on water related issues, data, and information for the 11 major hydrological river basins within the state. To date, three river basin plans have been completed: Bear River, Kanab Creek/Virgin River and Cedar/Beaver. This *Weber River Basin Plan* is the fourth to be completed.

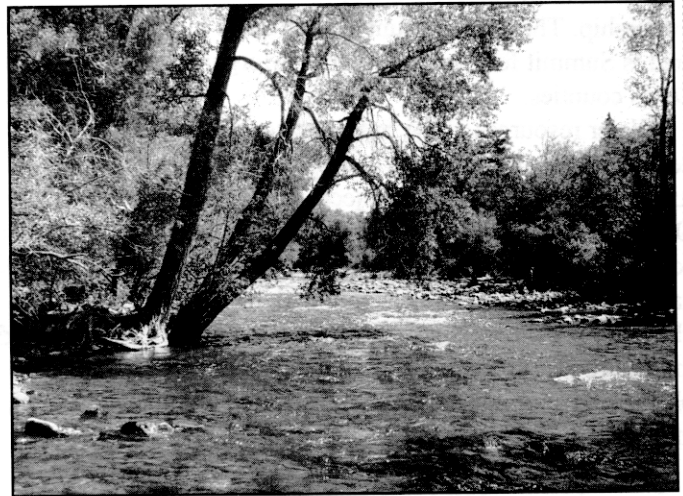
2.3 Introduction

Section 3 of the basin plan provides a general overview of water development in the basin. The section provides discussions on water planning, a historic account of water development and information about the basin's geophysical make-up.

The state legislature has directed the Board of Water Resources to plan for the future development of the state's waters. The preparation of the *Weber*

River Basin State Water Plan is a significant element of the state's water planning process. Basin plans are prepared with the overriding goal of providing accurate and timely information to all individuals and agencies involved with the use and development of water within a given drainage basin.

Summer temperatures in the lower basin can exceed 100 °F with winter temperatures well below zero in the upper basin. The average annual temperature in the lower basin is slightly over 50 °F,



Weber River

and the upper basin averages near 42° F. Average annual precipitation in the basin is near 21 inches.

The lower basin is a geologic remnant of ancient Lake Bonneville consisting of large sedimentary deposits. The upper basins are considered high mountain valleys with sedimentary deposits created during the high water stages of Lake Bonneville. The lower and upper basins are connected by two rugged canyons through the Wasatch Range: the Weber and Ogden rivers canyons.

The lower basin is home to a considerable amount

of irrigated agriculture. In 1987 just over 138,600 acres of land were under irrigation, primarily associated with the production of vegetables, small grains, forage crops and pasture for livestock. The urbanization of the basin in recent years, however, has established a trend that indicates substantial declines in acreages under irrigation. The current rate of decline has been estimated between 1,000 and 1,500 acres per year.

Areas with a high rate of urbanization include Davis and Summit counties. Davis County has experienced a high rate of population growth in the areas immediately adjacent to the Salt Lake City metropolitan area. Summit County is a popular outdoor recreational area with emphasis on outdoor recreation and the winter ski industry. Of primary interest is the Snyderville Basin and Park City Area which, in recent years, has proven to be among the fastest growing regions of the state with growth rates nearly double the overall basin and state average.

The 1.5 million acres encompassed by the basin's boundaries is divided into 1,214,100 acres of private, 36,800 acres of state and 249,100 acres of federal ownership. The largest county in the basin in land area is Summit followed by Weber, Morgan and Davis counties.

Water resources in the basin are considered fully developed as a result of the completion of three large federal water reclamation projects. The Weber River, Ogden River, and Weber Basin projects were completed over roughly a 50-year period from the early 1920s to late 1960s. Combined, these projects allowed for the construction of seven large multipurpose reservoirs, four culinary water treatment plants, and complex systems to distribute municipal, industrial and agricultural water.

Water supplies are distributed to various domestic end users by over 320 water provider agencies. These agencies typically include water conservancy and subconservancy districts, canal and ditch companies, public works departments, and a variety of small water companies and service districts.

2.4 Demographics and Economic Future

Section 4 provides information and data regarding current and projected population and economic growth. As is the case with most of the state, the four counties encompassed by the Weber River Basin are currently experiencing moderate to rapid growth in residential and commercial development. Weber,

Davis and Morgan counties have growth rates near 2.0 percent. Summit County, however, is one of the state's most rapidly growing areas with a current and projected growth rate of nearly 4.0 percent. The rapid growth in Summit County is primarily in the Snyderville Basin and Park City Area. The current population in the basin is 420,000, which is expected to grow to nearly 700,000 by the year 2020.

Park City and the Snyderville Basin are located within an isolated high mountain valley directly east of metropolitan Salt Lake City. The area offers its residences a desirable lifestyle that includes an alpine-mountain environment and access to quality year-around outdoor recreation. The lifestyle and relative close proximity to major metropolitan areas are the main factors for the area's rapid rate of growth.

Employment opportunities and overall economic growth in the basin are expected to sustain moderate growth after a number of years of stagnation associated with the recent downsizing of local government facilities. In fact, service and trade sectors are expected to overtake government within the next 10 years as the basin's largest employers. Other sectors of the local economy are projected to show moderate growth for local job opportunities, including real estate, manufacturing, construction, finance, insurance, transportation, community service, public transportation, agricultural and mining. Total basin employment is projected to grow from approximately 173,800 jobs currently to over 303,000 jobs by the year 2020.

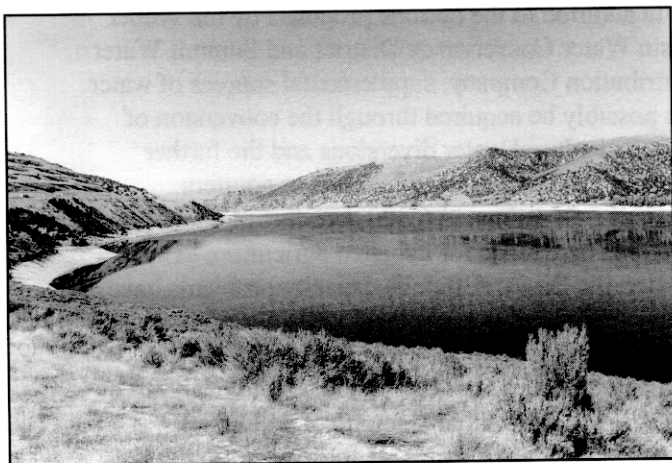
2.5 Water Supply and Use

Section 5 of the basin plan discusses the current level of water supply and use. The basin's total water supply is generally presented in terms of average annual water yield based on the most recent water budget analysis conducted by the Division of Water Resources. Levels of water use are summarized by various categories including municipal and industrial (M&I) culinary, M&I secondary, agricultural, and water use by natural vegetation (wetland and riparian).

The basin's water resources are considered fully developed. Seven major storage reservoirs have been constructed as primary elements of the Weber River, Ogden River, and Weber Basin projects. An additional major reservoir was constructed by the Weber Basin Water Conservancy District. The combined active storage of these reservoirs is

estimated at 525,900 acre-feet, which is over 50 percent of the basin's average annual water yield of 979,400 acre-feet per year.

The current (1992) level of M&I water use is estimated at 92,000 acre-feet and 80,000 acre-feet for culinary and secondary uses respectively. The current (1992) total annual diversions for irrigated agriculture is estimated to be 446,400 acre-feet. Combined, wetland and riparian acreages in the basin account for an estimated 270,000 acre-feet of water use annually. Reservoir annual net evaporation is estimated at 45,000 acre-feet.



Echo Reservoir

2.6 Management

The proper or prudent management of the basin's water supplies is a significant and complex undertaking. Diversions are made to thousands of end users as culinary, secondary and agricultural irrigation water. The accounting of these diversions combined with the daily operation and maintenance of treatment, storage and diversion facilities to provide the indicated water service is accomplished by hundreds of water provider organizations. The role of these organizations, their respective responsibilities and a number of problems and needs associated with water management are discussed in Section 6.

2.7 Regulation/Institutional

Considerations

As discussed in Section 7, the responsibility for the regulation of the state's water resources rests primarily with the Division of Water Rights and the Department of Environmental Quality. The roles of

these agencies and various environmental concerns are discussed in this section. Dam safety programs are also discussed.

2.8 Water Funding Programs

Section 8 provides information on funding programs offered through a number of state and federal agencies regularly involved with the development of water projects. Funding programs include loans and grants associated with the design, construction and study of viable water development projects. Funding is generally offered to local water provider and reclamation agencies for the expansion or construction of water-related facilities. These often include water conveyance, storage and treatment facilities.

2.9 Water Planning and Development

Perhaps one of the most important aspects of the overall water planning process is the projection of future water demand. Section 9 offers detailed information and data regarding current and projected water demand including a number of issues impacting water demand that are unique to the Weber River Basin.

The Weber River Basin is currently experiencing a moderate to rapid rate of population growth; the result of which is a marked increase in the overall urbanization of the basin.

Areas that have historically supported irrigated agriculture are rapidly being converted to residential and commercial developments. This situation is typical throughout the state, but somewhat more pronounced in Weber, Davis and Morgan counties.

As a result of the basin's current trend toward the urbanization of agricultural areas, the demand for M&I water has increased at rates that roughly parallel the growth in population. The 1992 annual rate of M&I water use is estimated at 172,000 acre-feet. This total includes 92,000 acre-feet and 80,000 acre-feet associated with the use of culinary and secondary water respectively. Total annual M&I culinary and secondary water demands are projected to increase to 142,900 acre-feet and 188,900 acre-feet respectively by the year 2020.

Although the demand for M&I water is increasing, the overall, basin-wide demand for water is projected to remain at or near its current level for the next 25 years. The overriding basis for this projection is the conversion of water historically used for irrigated

agriculture to M&I uses. With the replacement of agricultural land to residential and commercial developments, roughly 4,000 to 5,000 acre-feet of agricultural water becomes available annually for possible conversion to M&I uses. In addition, 25,000 to 30,000 acre-feet of active storage within Willard Reservoir is currently earmarked for conversion to M&I use in the lower basin.

The annual demand for agricultural irrigation water in 1987 was 472,700 acre-feet. However, with the steady decline of irrigated agriculture, these diversions are expected to be reduced to an estimated 328,200 acre-feet by 2020. Most of the reduction is expected to be converted to M&I use.

The Snyderville Basin and Park City Area is currently experiencing a 4.0 percent rate of growth that is twice the basin average. This high growth rate is also driving a significant increase in the demand for M&I water throughout the area. This relatively high increase in water demand, coupled with substantial infrastructure limitations by a number of local and regional water supplies, has created a water shortage problem that requires a solution within the immediate future. Of major interest are two projects proposing the importation of supplemental water from Smith and Morehouse and East Canyon reservoirs.

The Weber Basin Water Conservancy District has completed a preliminary study to deliver up to 6,000 acre-feet of water held in storage within Smith and Morehouse Reservoir. The project calls for the construction of a diversion structure immediately downstream of Wanship Dam with associated treatment, storage and conveyance facilities that would ultimately deliver upper Weber River water to Keetly Junction east of Park City. Final distribution of the supplemental water would require the construction of redundant pipelines, storage tanks and booster pump stations or the negotiation of an agreement with local water distribution companies to use existing distribution and storage facilities.

A second option of providing supplemental water has been proposed by Summit Water Distribution Company. Summit's project would distribute water currently stored in East Canyon Reservoir to local end users via their existing distribution system. An agreement being finalized between the Davis and Weber Counties Canal Company and Summit Water Distribution Company would obligate up to 5,000 acre-feet of annual water supplies to be distributed throughout the Snyderville Basin and Park City Area.

Summit's proposal could be implemented immediately with a gradual increase in actual water deliveries over an extended period of time. The project requires the development of a few initial wells adjacent to East Canyon Creek, on an as-needed basis, discharging pumped water into Summit's existing distribution system. Subsequent wells would be brought on-line as needed. Ultimately, to develop the entire 5,000 acre-feet of supplemental supply, a treatment plant may be constructed at East Canyon Reservoir with treated culinary water pumped into the extended Summit conveyance system up East Canyon to the Snyderville Basin and Park City Area.

In addition to the options proposed by the Weber Basin Water Conservancy District and Summit Water Distribution Company, supplemental sources of water can possibly be acquired through the conversion of local agricultural water diversions and the further development of existing groundwater aquifers. Currently, an estimated 6,300 acre-feet of annual diversions are made for irrigated agriculture in the Snyderville Basin. Although capacity problems have been experienced in some local wells during times of peak demand, preliminary investigations by the Division of Water Rights and U.S. Geological Survey indicate that substantial amounts of additional groundwater may be available for distribution in the Snyderville Basin and Park City Area. A study will be completed in the near future to better quantify the indicated amount of supplemental groundwater that may be provided by local aquifers.

2.10 Agricultural Water

Section 10 of the basin plan focuses on items relating to the current and projected demand for agricultural irrigation water. These items are primarily centered on the overall decline of irrigated agriculture in the basin and the conversion of unused irrigation water rights to M&I uses. The Weber River Basin has long been recognized as one of the most prominent agricultural areas in the state. The abundance of fertile soils, water and a relatively mild climate in the lower basin has allowed for exceptional farming and ranching opportunities. In 1987 irrigated agriculture diverted 472,700 acre-feet of the basin's total annual yield of 979,400 acre-feet. However, annual diversions for irrigated agriculture are on the decline. The current rate of acreage loss to urbanization is estimated between 1,200 to 1,500

acres annually. The current (1992) rate of water use by irrigated agriculture is 446,400 acre-feet per year.

2.11 Drinking Water

Section 11 discusses current levels of drinking water use, pertinent state and federal regulations, and issues that impact drinking water quality. Public drinking water service is currently provided by 76 community and 95 non-community distribution systems within the basin. The system includes six surface water treatment plants and an estimated 350 well systems owned and operated by a combination of private individuals, municipal public works departments and various water provider agencies. Four of the treatment plants were initially constructed as major elements of the federal Weber Basin Project. Three of the four Weber Basin plants are currently owned and operated by the Weber Basin Water Conservancy District, with the remaining project plant owned and operated by Ogden City. The other non-project treatment plants are owned and operated by Bountiful City and Park City Corporation. Culinary water demand in 1992 was 92,000 acre-feet, of which 35,900 acre-feet was provided by surface water sources.

Regulations to maintain adequate water quality for drinking water have been established by state and federal safe drinking water acts. Combined, these laws provide for 1) adequate drinking water standards, 2) monitoring programs over the construction of water treatment facilities, 3) protection of watersheds for raw drinking water sources, 4) administration of various funding programs to construct new treatment and distribution facilities, 5) training programs for the owners and operators of drinking water systems, and 6) administration of programs aimed at enforcing all state and federal drinking water quality standards.

2.12 Water Quality

Section 12 of the basin plan addresses issues, presents regulations, and discusses the responsibility of various state and federal organizations to maintain an acceptable level of water quality throughout the basin.

Although water quality is a concern throughout the basin, of paramount concern is the quality of surface water and groundwater in the upper Weber and Ogden rivers drainages, specifically Ogden Valley, Snyderville Basin and the Park City area.

These areas of the upper drainage are currently experiencing unprecedented growth rates and associated increases in the discharge of wastewater effluent to existing river and storage systems.

The current level of water quality in Ogden Valley is within all state and federal standards for drinking water sources and recreation, but the increased load of nutrients to underlying groundwater aquifers will eventually create a marked decrease within local surface water and groundwater systems. Of particular concern is the potential contamination and eutrophication of Pineview Reservoir.

Two wastewater treatment plants owned and operated by the Snyderville Basin Sewer Improvement District (SBSID) have, in recent years, discharged various contaminants (primarily phosphorus and some heavy metals) to the upper Weber River system resulting in a marked degradation of water quality in local streams and reservoirs. Significant amounts of nutrients (primarily phosphorus) have been discharged to the lower East Canyon Creek which flows into East Canyon Reservoir. The Silver Creek plant has discharged effluent with relatively high concentrations of zinc resulting in a reassessment of the lower Silver Creek system as not meeting state Class 3A standards for a cold water fishery.

The deterioration of the Chalk Creek watershed is another area of concern in the upper Weber River drainage. In recent years, poor land use practices by oil and gas exploration companies and local livestock ranchers have effectively destroyed the natural vegetation and overall drainage characteristics within the watershed. The deterioration of the watershed has resulted in excessive sediment loads conveyed from the upper Chalk Creek drainage to the lower Weber River system. However, an ongoing state administered nonpoint source program has been implemented in the drainage with positive results. Critical areas of the drainage have been revegetated with a measured decrease in sediment loads to the lower Weber River.

2.13 Disaster and Emergency Response

Section 13 offers information regarding water-related natural disasters, including various programs offered by state and federal agencies to effectively deal with the prevention and management of these disasters.

Flooding is perhaps one of the most prominent of all natural disasters. The Weber River Basin, as recent history shows, is not immune from flood-related disasters. The floods of the mid-1980s resulted in tens-of-millions of dollars in damage to homes, farms and a number of commercial businesses. Flooding in the basin has occurred in two ways: out of bank flows from local rivers and streams, and the steady rise of water surface elevations within the Great Salt Lake. Flooding along existing river and stream alignments has caused substantial property damage primarily to residential homes throughout the basin. Of concern are the reaches of the Ogden and Weber rivers in the upper drainages and the numerous small streams along the western side of the Wasatch Front. These streams and rivers are subject to severe flooding due to excessive snow pack runoff and flash floods generated from localized thunder storms.

The rising waters of the Great Salt Lake also have been responsible for substantial property damage in western Weber and Davis counties. During the 1987 water year, the lake reached the estimated 100-year record level of 4211.60. Resulting property damage and loss of commercial and industrial business amounted to well over \$40 million. Property damage to local farms and ranches was measured in the hundreds-of-thousands of dollars.

The possibility of a dam failure due to a major seismic or hydrologic event exists throughout the basin, and must be accounted for in comprehensive emergency planning efforts. Dams constructed with federal water reclamation projects are reviewed and evaluated for structural integrity by the Bureau of Reclamation. All other dams fall under the jurisdiction of the Utah Division of Water Rights. As a result of the bureau's dam safety program, Pineview Dam in the Ogden Valley was recently retrofitted with structural fill at the dam's base to provide an additional factor of safety against failure by liquefaction during an earthquake. The remaining dams in the basin are currently under investigation by either the Division of Water Rights or Bureau of Reclamation for needed structural improvements.

2.14 Fisheries and Water-Related Wildlife

Section 14 offers information relating to the status of fisheries and water-related wildlife throughout the basin. Discussions center around the types of species

found in the basin, including threatened and endangered species and the condition of their habitat. Information is also provided on state and federal agencies charged with the responsibility to administer various programs aimed at managing and maintaining fish and wildlife populations in the basin.

The Weber River Basin features an abundance of wildlife and includes a considerable amount of quality wildlife habitat. From a recent inventory, it has been estimated that 247 species of mammals, 46 species of reptiles, 13 species of amphibians, 436 species of birds and over 40 species of fish are found in the four county area encompassed by the basin's hydrologic boundaries. Of the stated number of species, only the Peregrine falcon and Whooping crane are included in the federal endangered category. The Bald eagle is also found in the basin, but it is only categorized as threatened.

In terms of habitat, the basin is home to four large wildlife or waterfowl management areas, hundreds of miles of quality fishing streams, eight major reservoir-fisheries, and hundreds-of-thousands of acres of private and public range land for all species of game and nongame animals. Major waterfowl facilities include the Harold S. Crane, Ogden Bay, Farmington Bay and Howard Slough wildlife management areas.

Management of the basin's wildlife habitat and water-related wildlife management areas is provided primarily by the Division of Wildlife Resources, U.S. Fish & Wildlife Service and, to some extent, the Bureau of Reclamation. The Division of Wildlife Resources operates and maintains the basin's wildlife management areas. The U.S. Fish & Wildlife Service is responsible for the administration of all federal regulations associated with the Endangered Species Act.

Of concern is the quality of water in the upper basin reservoir-fisheries. Pineview and East Canyon reservoirs are directly downstream of areas of high residential and commercial growth. In recent years, additional nutrient loading (primarily phosphorus) has resulted in a degree of eutrophication within East Canyon Reservoir. Water quality in the reservoir has been degraded resulting in adverse affects on the reservoir and stream fishery. In a recent basin-wide water quality study, the Division of Water Quality identified need for additional tertiary treatment at the East Canyon wastewater treatment plant.

Although the current water quality within Pineview Reservoir is adequate for recreational uses and subsequent treatment to drinking water standards, concern is expressed for the reservoir's water quality in future years. Continued use of septic tanks and drain fields for the disposal and treatment of domestic wastewater in the Ogden Valley creates a high potential for a marked reduction in groundwater and surface water quality. This is a potential problem for the fishery in Pineview, and for water recreationist and operators of downstream culinary water treatment plants.

2.15 Water-Related Recreation

Section 15 presents information relating to water-related recreational opportunities in the basin including discussions on facility management and current issues associated with the operation and management of existing campgrounds, parks, streams, rivers and reservoirs.

The Weber River Basin includes thousands of acres of reservoirs and hundreds of miles of streams and rivers, all of which offer prime outdoor recreational opportunities to native Utahns and thousands of out-of-state visitors. The basin's reservoirs, rivers and streams provide recreation in the form of cold and warm water sport fishing, boating on eight major reservoirs with modern camping and boating facilities, rafting and kayaking down the early spring rapids of the Ogden and Weber rivers, and the simple enjoyment of hiking through any one of the basin's many river or stream canyons to enjoy exceptional high mountain scenery and solitude.

Past water development projects have produced eight large reservoirs in the basin that include modern camping and boating facilities. Campgrounds, boat ramps and marinas exist at Willard, Pineview, Causey, Lost Creek, East Canyon, Echo, Wanship and Smith and Morehouse reservoirs. The Division of Parks and Recreation operates campgrounds and boating facilities at Willard, Lost Creek and East Canyon reservoirs, and Rockport Lake. The U.S. Forest Service operates similar facilities at Pineview and Smith and Morehouse reservoirs.

Issues associated with water-related recreation generally include the overcrowding of existing reservoirs by boating traffic, vandalism, and abuse of campgrounds and private property immediately adjacent to reservoir recreation sites, and the long-

range management of existing campgrounds. The number of recreational boaters has steadily increased in recent years to a point where boating safety is an urgent and immediate concern at many popular reservoirs. To address the issue, the Division of Parks and Recreation offers classes on boating safety with the goal of making significant reductions in the number of boating accidents throughout the state.

One of the more isolated campgrounds and boating facilities in the basin is Lost Creek Reservoir. The reservoir was constructed in an extreme uppermost reach of the overall Weber River drainage. Due to its remote and isolated location, Lost Creek Reservoir is somewhat unique when compared with other reservoirs in the basin. Most of the campgrounds, boating ramps and access roads surrounding the reservoir are immediately adjacent to private property. The combination of the reservoir's isolation from populated areas and relative close proximity to private property with off-road and hunting opportunities has caused instances of substantial vandalism and abuse to public and private property in and around the reservoir. The Bureau of Reclamation has recently completed a *Resource Management Plan* to address these issues and develop measures to better manage the overall activities of recreationists at the reservoir.

With the escalating popularity of basin reservoirs as outdoor recreation sites, the need to expand and improve upon existing campgrounds and boating facilities is readily apparent. The demand for camping and boating facilities has grown in nearly direct proportion to the population. The managers/administrators of these facilities, including the Division of Parks and Recreation and the U.S. Forest Service, need to develop long-range plans for recreational sites and implement programs to construct needed facilities as demand dictates.

2.16 Federal Water Planning and Development

Section 16 discusses the overall involvement of the federal government in the development and planning of the basin's water resources. Federal agencies involved with the planning and development of water have changed roles in recent years. The emphasis has changed from the design and construction of reclamation projects to the conservation and preservation of the general environment. At the same time, the need for design

and construction funding and expertise on water projects has been left to state agencies.

Current federal funding and assistance programs are presented for 12 agencies including the Bureau of Reclamation; Bureau of Land Management; Cooperative Research, Education and Extension Service; Corps of Engineers; and the Environmental Protection Agency. Others are the Farm Service Agency, Federal Emergency Management Agency, Fish and Wildlife Service, Forest Service, Geological Survey, Natural Resources Conservation Service, and Rural Development.

2.17 Water Conservation /Education

The ongoing need for water conservation is a concept accepted by nearly all local, state and federal agencies involved with the development, planning and distribution of a basin's water resources. Section 17 discusses the need for water conservation and provides recommendations, programs and the means by which substantial amounts of water may be conserved for all typical domestic uses.

Irrigated agriculture is the single largest user of water in the basin with current (1992) diversions estimated at 446,400 acre-feet per year. It is apparent that improvements to existing land application methods and water conveyance systems can reduce annual diversions by thousands of acre-feet. Improvements to irrigation efficiencies can be made through the conversion of flood to sprinkler irrigation application methods, or by optimizing widely used flood irrigation methods that incorporate proven engineering concepts for furrow and border irrigation.

Although irrigated agriculture is the basin's current largest user of water, the demand for M&I water is the fastest growing component of total water use. As a result, the main target of current water conservation programs and policies has focused on M&I water users; or more specifically, the outdoor use of secondary water and the installation of low-flow plumbing fixtures.

An evaluation of the potential implementation of water conservation measures in Davis and Weber counties by the Wasatch Front Demand/Supply Model indicates that over 13 percent of all M&I diversions can be conserved by the year 2020. This level of conservation is mainly affected by the replacement over time of conventional to low-flow plumbing fixtures in new residential and commercial construction. Other factors affecting water

conservation include conservation landscaping and water pricing .

2.18 Industrial Water

As presented in Section 18, the basin's major industrial water users generally include oil refineries, various rock product providers (concrete and asphalt plants), some mining operations, metal finishing plants, two industrial parks and one mineral processing plant adjacent to the Great Salt Lake. The mineral processing plant uses 20,200 acre-feet per year of potable and non-potable water, and the other industrial plants combined use an estimated 5,700 acre-feet per year. The total industrial water demand is expected to increase to an estimated 42,200 acre-feet per year by 2020.

Future levels of industrial water use are difficult to predict. Water demand that can be generated by industry varies over a considerable range depending on the type of product manufactured or the overall process required to produce a given product. An example of this in the Weber River Basin would be the comparison of water demand at the Weber Industrial Park versus mineral mining processes adjacent to the Great Salt Lake. Both operations employ hundreds of people, but the mineral processing industry requires hundreds, if not thousands, of times as much water. Generally, however, the demand for industrial water is projected to parallel the rate of population growth at roughly 2.0 percent.

2.19 Groundwater

Section 19 provides hydrogeologic data and information for the basin's six groundwater basins. Information and data given include brief descriptions of existing geology, groundwater yield in terms of annual pumpage and various problems associated with each basin.

The groundwater basins encompassed by the overall hydrological boundaries of the Weber River Basin can be divided into lower and upper groundwater systems. The lower groundwater basin is located west of the Wasatch Front with the remaining upper groundwater basins east of the mouths of Ogden and Weber canyons. In terms of overall surface and groundwater hydrology, the Weber River Basin is considered closed with very little of its annual water supply derived from outside imports. Groundwater flows, therefore, are generated from

annual precipitation primarily in the form of snowpack in the upper drainages.

The largest groundwater basin is found in the East Shore Area. This area includes all of Weber and Davis counties lying between the east shore line of the Great Salt Lake and the western slopes of the Wasatch Front. The aquifer is highly stratified consisting of various layers of clays, silts and gravels deposited by several hydrogeologic phases associated with the development and decline of ancient Lake Bonneville. The average annual recharge to the aquifer is estimated at 121,000 acre-feet with a current rate of annual pumpage of 68,000 acre-feet per year. The balance of groundwater flow in the aquifer is discharged to local surface water channels, springs or to the Great Salt Lake.

The subsurface geology of the Ogden Valley groundwater aquifer is similar to that of the East Shore Area. The aquifer consists of a number of stratified material layers allowing for the development of shallow or confined aquifer systems. Groundwater is the main supply of culinary water in the valley and accounts for an estimated 17,700 acre-feet of annual pumpage from either conventional or artesian wells. The shallow and confined aquifers are recharged from direct precipitation and from the infiltration of spring runoff along the benches of the surrounding mountain ranges.

Groundwater aquifers in the upper Weber River drainage include the Central Weber Valley, Park City, Rhodes Valley and Weber Valley above Oakley. With the exception of Park City, the aquifers in the upper drainage consist of shallow alluvial materials that are directly impacted by surrounding surface water streams and rivers. Groundwater elevations in these aquifers fluctuate in nearly direct correlation with flows in surrounding surface water systems. Little information is available regarding bedrock conditions in these aquifers. As a result, the water yielding or hydraulic characteristics of the deep aquifer are not known. Shallow wells in these aquifers average an estimated 5,900 acre-feet annual production primarily for culinary water uses.

The Park City aquifer consists of an unknown combination of consolidated and unconsolidated materials. Unconsolidated aquifers are primarily made up of alluvial deposits while the consolidated portions of these aquifers consist of fractured bedrock materials. Combined local well production is over 5,600 acre-feet per year for culinary water. In

addition, and with the current rate of growth in the Snyderville Basin and Park City Area, the annual pumpage is projected to increase at a substantial rate. Capacities of some wells in the area, however, have declined to levels prompting the State Engineer to invoke a moratorium on future well development. ❖